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EXAMINER	
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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 0304

Application Number: 09/575,349
Filing Date: May 19, 2000
Appellant(s): D'ELIA ET AL.

Robert J. Crawford
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 12/9/03.

(1) *Real Party in Interest*

A statement identifying the real party in interest is contained in the brief.

(2) *Related Appeals and Interferences*

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) *Status of Claims*

The statement of the status of the claims contained in the brief is correct.

(4) *Status of Amendments After Final*

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) *Summary of Invention*

The summary of invention contained in the brief is correct.

(6) *Issues*

The appellant's statement of the issues in the brief is correct.

(7) *Grouping of Claims*

Appellant's brief includes a statement that claims 18-30 do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5,015,330	Okumura et al.	5-1991
5,710,073	Jeng et al.	1/1998
6,143,080	Bartholomew et al.	11-2000

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 18-21, 26, 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Okumura et al. (U. S. Pat. 5,015,330).

The claimed method and apparatus of claims 18 and 19 are anticipated by Okumura et al. which discloses in Figs. 8 and 15, two systems for forming a coating on a surface of a semiconductor wafer in a CVD arrangement, the system of fig. 8 comprises injector means 92 for supplying a uniform supply of gas to the wafers; the surface being in a zone of the CVD arrangement that exhibits a depleted gas supply absent the

injector means; and means for using the supplied gas in combination with selected reactants to deposit a coating on the wafer; Okumura also discloses the system of fig. 15 that comprises injector means 25 for supplying a uniform supply of gas to the surface of the wafer, the surface being in a zone of the CVD arrangement that exhibits a depleted gas supply absent the injector means as shown in the fig. 15, for example if one of the injectors 25 is absent a depleted gas supply zone would occur at the side where the injector is not present; and means for using the supplied gas in combination with selected reactants to deposit a coating on the wafer. It is respectfully submitted that both systems individually anticipate the claimed invention.

With regards to claims 20 and 21, Okumura discloses that the arrangement is provided with various pairs of electrodes in order to supply the gas plasma in a non-uniform or uniform manner by creating a non-uniform electric field, thus the gas can be supplied in different quantities to different zones of the CVD arrangement to compensate for a gas depletion rate as the alternative taught by Okumura in col. 5, lines 39-47.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okumura et al. (U. S. Pat. 5,015,330) in view of Jeng et al..

The claimed method and apparatus are taught by Okumura et al. which discloses in Figs. 8 and 15, two systems for forming a coating on a surface of a semiconductor wafer in a CVD arrangement, the system of fig. 8 comprises injector means 92 for supplying a uniform supply of gas to the wafers; the surface being in a zone of the CVD arrangement that exhibits a depleted gas supply absent the injector means; and means for using the supplied gas in combination with selected reactants to deposit a coating on the wafer; Okumura also discloses the system of fig. 15 that comprises injector means 25 for supplying a uniform supply of gas to the surface of the wafer, the surface being in a zone of the CVD arrangement that exhibits a depleted gas supply absent the injector means as shown in the fig. 15, for example if one of the injectors 25 is absent a depleted gas supply zone would occur at the side where the injector is not present; and means for using the supplied gas in combination with selected reactants to deposit a coating on the wafer. It is respectfully submitted that both systems individually anticipate the claimed invention.

With regards to claims 22, 23, 24, 25, Okumura as applied above discloses the claimed invention with the exception of the use of dichlorosilane and ammonia, and depositing an anti-reflective coating.

Jeng et al. teaches a method for forming a coating on a surface that comprises supplying a gas to a chamber, and using the supplied gas in combination with selected

reactants and depositing a coating on the wafer, wherein the gas includes ammonia and dichlorosilane, wherein depositing a coating on the wafer includes depositing an anti-reflective coating (ARC) having uniform optical properties, wherein the ARC has a k value between 0.3 and 0.5, and the method further includes performing photolithography using the ARC, wherein the use of ammonia and dicholorosilane and the deposition of an antireflective coating are performed by a CVD arrangement for the disclosed intended purpose of providing a smooth surface that improves the accuracy of the patterning steps.

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to introduce reactants like ammonia and dichlorosilane, and to deposit an anti-reflective coating as Jeng et al. teaches with the CVD arrangement of Okumura for the purpose of depositing a uniform film over a semiconductor substrate that provides a smooth surface that improves the accuracy of the patterning steps in order to form high density integrated circuits.

Claims 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okumura in view of Bartholomew et al..

The claimed method and apparatus are taught by Okumura et al. which discloses in Figs. 8 and 15, two systems for forming a coating on a surface of a semiconductor wafer in a CVD arrangement, the system of fig. 8 comprises injector means 92 for supplying a uniform supply of gas to the wafers; the surface being in a zone of the CVD arrangement that exhibits a depleted gas supply absent the injector

means; and means for using the supplied gas in combination with selected reactants to deposit a coating on the wafer; Okumura also discloses the system of fig. 15 that comprises injector means 25 for supplying a uniform supply of gas to the surface of the wafer, the surface being in a zone of the CVD arrangement that exhibits a depleted gas supply absent the injector means as shown in the fig. 15, for example if one of the injectors 25 is absent a depleted gas supply zone would occur at the side where the injector is not present; and means for using the supplied gas in combination with selected reactants to deposit a coating on the wafer. It is respectfully submitted that both systems individually anticipate the claimed invention.

Okumura discloses the claimed invention with the exception of providing a gas concentration detector in the CVD arrangement and adjusting the gas injector in response to a detected concentration.

Bartholomew et al. teaches a method that comprises adjusting a gas injector in a CVD arrangement by providing at least one gas concentration detector in the CVD arrangement in the form of a sensor that measures the flow characteristics of at least one of the gases in the gas flow path (Col. 4, ll. 48-55), and in response, to the detected characteristic, the gas injector is adjusted, wherein the detector is removed from the CVD arrangement after detecting the concentration of the supplied gas.

Thus, it would have been obvious to one of ordinary skill in the art to use a CVD arrangement that would control the introduction of the gases according to the concentration or other characteristics of the gases for the disclosed intended purpose of

Bartholomew et al. of controlling the reaction as the flow rate of gases affect the extent and uniformity of the deposition reaction in the invention of Okumura.

(11) Response to Argument

The instant method essentially comprises a method for forming a coating on a surface of a semiconductor wafer in a CVD arrangement, wherein the method comprises supplying a gas to the surface of the wafer using a gas injector adapted to maintain uniform supply of the gas in a zone of the CVD arrangement that would exhibit a depleted gas supply absent the injector; and using the supplied gas in combination with selected reactants and depositing a coating on the wafer.

Appellant primarily argues that Okumura et al. fails to teach the supplying a uniform supply of gas to the surface of the wafer.

In particular, appellant argues that Okumura et al. is directed to the issue of gas density unevenness between vertically displaced wafers while appellant's issue of evenness is across the surface of the wafer, that Okumura et al. teaches that the gas is to be injected directly at the wafer with a resultant unevenness at the wafer surface being ignored.

While it is correct that Okumura et al. discloses that the issue addressed is the uniform treatment and mass treatment of target objects, it is respectfully submitted that is also a purpose of Okumura et al. to use the apparatus to ensure that etching is uniformly done on the surface of each wafer or a film is uniformly formed thereon (col. 4, lines 62-64), and that in order to ensure that the etching is uniformly done or a film is

uniformly formed on the surface of a wafer, a uniform supply of the reactant gas to the surface of the wafer is required. Furthermore, Okumura et al. discloses a rotary shaft at the center of the boat support to ensure that, by a horizontal rotation of the wafers, a uniform supply of etching or reactant gas is supplied to the wafers.

It is respectfully submitted that the claim language refers to "supplying gas to the surface of the wafer using a gas injector adapted to maintain uniform supply of the gas in a zone of the CVD arrangement that would exhibit a depleted gas supply absent the injector", and that as shown in figs. 8 and 14 of Okumura et al. if either the injector 92 or one of the injectors 25 were absent, respectively, from the arrangement, a depleted gas supply zone will be formed in the CVD arrangement and that uniform supply of gas to the surface of the wafer could not be maintained.

With regards to appellant's description of the invention including the feature that a vertical arm of the injector indirectly injects gas through outlet holes , with the holes being directed away from the respectively situated wafers and toward the surrounding reactor tube wall which, in turn, carries the gas in an even flow toward all sides of each wafer so that the gas is dispersed uniformly in the wafer zone from the reactor wall, it is respectfully submitted that this features are not included in the claims' language, and that the claims as presently considered do not exclude the injector having outlet holes directed towards the wafers, and it is further submitted that Okumura et al. intends to achieve the uniform dispersion of the gas in the wafer zone

by using varying the pitches of the gas discharge holes, as taught in col. 10, lines 24-32 and fig. 8.

Appellant secondarily argues that the Okumura et al. reference explicitly acknowledges that its wafer-directed-gas injection approach does not distribute gas uniformly to the wafers; it is respectfully submitted that Okumura et al. discloses in col. 5 lines 2-9 that the reactive gas is ejected parallel to the surfaces of the wafers stacked vertically, through the perforations bored in the guide tube, and is uniformly introduced onto the to-be-treated surface of the wafers, and this feature is present in all the embodiments of Okumura et al., furthermore the examiner respectfully submits that there is no explicit acknowledgement in the Okumura et al. reference that its wafer-directed-gas injection approach does not distribute the gas uniformly to the wafers, contrarily Okumura et al. as cited above explicitly teaches the uniform distribution of the gas to the surface of the wafers.

Appellant thirdly argues that the examiner improperly combines different embodiments of the Okumura et al. reference with no explanation of how these different embodiments are combined. It is respectfully submitted that the examiner relies on the embodiment described by Fig. 8 of Okumura et al. but as well in features that are common to all embodiments as described by Okumura et al.. In the instant case, the use of injectors 42, 47, and 92 having perforations bored in the guide tube that eject the gas parallel to the surfaces of the wafers is common to both embodiments, and, it is

respectfully submitted that the result of a uniform introduction of the gas onto the surfaces of the wafers is common to the embodiments of Okumura et al..

Appellant argues that the Office Action failed to present evidence of motivation in support of the proposed combination of Jeng et al. and Okumura et al., that the examiner did not provide any citations or teachings from the Jeng et al. reference to indicate that the Jeng et al. reference would be combinable with the CVD arrangement of the Okumura et al. reference.

It is respectfully submitted that the Jeng et al. reference is relied upon for the use of specific gases in a CVD method and apparatus, and that the need for a CVD arrangement that provides for the uniform deposition of an anti-reflective coating is within the scope of one of ordinary skill in the art as both Jeng et al. and Okumura et al. teach the need for the formation of uniform films in the semiconductor structures currently being manufactured.

Appellant argues that the combination of Okumura et al. and Bartholomew et al. fails to teach or suggest the limitations of the claimed invention, in particular the feature of providing a gas concentration detector in the CVD arrangement and adjusting the gas injector in response to a detected concentration. It is respectfully submitted that Okumura et al. discloses the CVD arrangement including injector means that ensure a uniform supply of gas to the wafers, and Bartholomew et al. discloses a CVD arrangement including adjusting a gas injector in the arrangement in response to a reading of at least one gas concentration detector in the CVD arrangement, wherein the

detector and the corresponding adjustment are performed for the disclosed intended purpose of controlling the reaction as the flow rate of the gases affect the extent and uniformity of the deposition reaction. Thus, as both Bartholomew et al. and Okumura et al. teach that the motivation for having a CVD arrangement that comprises an injector that maintains a uniform supply of gas to the wafers, and a detector that ensures that a uniformity in the reaction is preserved, the proposed combination teaches all the claimed limitations and provides a proper reason for combining, which is the provision of an injector and a detector that ensure a uniform supply of gas to a CVD arrangement.

Finally, it is respectfully submitted that Okumura et al. discloses both a system and a method for forming a coating on a surface of a semiconductor wafer in a CVD arrangement, wherein the system and the method comprise supplying gas to the surface of a wafer using a gas injector adapted to maintain uniform supply of the gas in a zone of the CVD arrangement that would exhibit a depleted gas supply if the injector was not part of the CVD arrangement, and that Okumura et al. achieves both an even gas density in the CVD arrangement as well as a uniform supply of gas to the surface of the wafer as taught in col. 6, ll. 28-30, col. 10, ll. 24-33, and col. 5, ll. 1-9.

For the above reasons, it is believed that the rejections should be sustained.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Ginette Peralta
March 17, 2004

Conferees

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